ANNOTATED

INDEX

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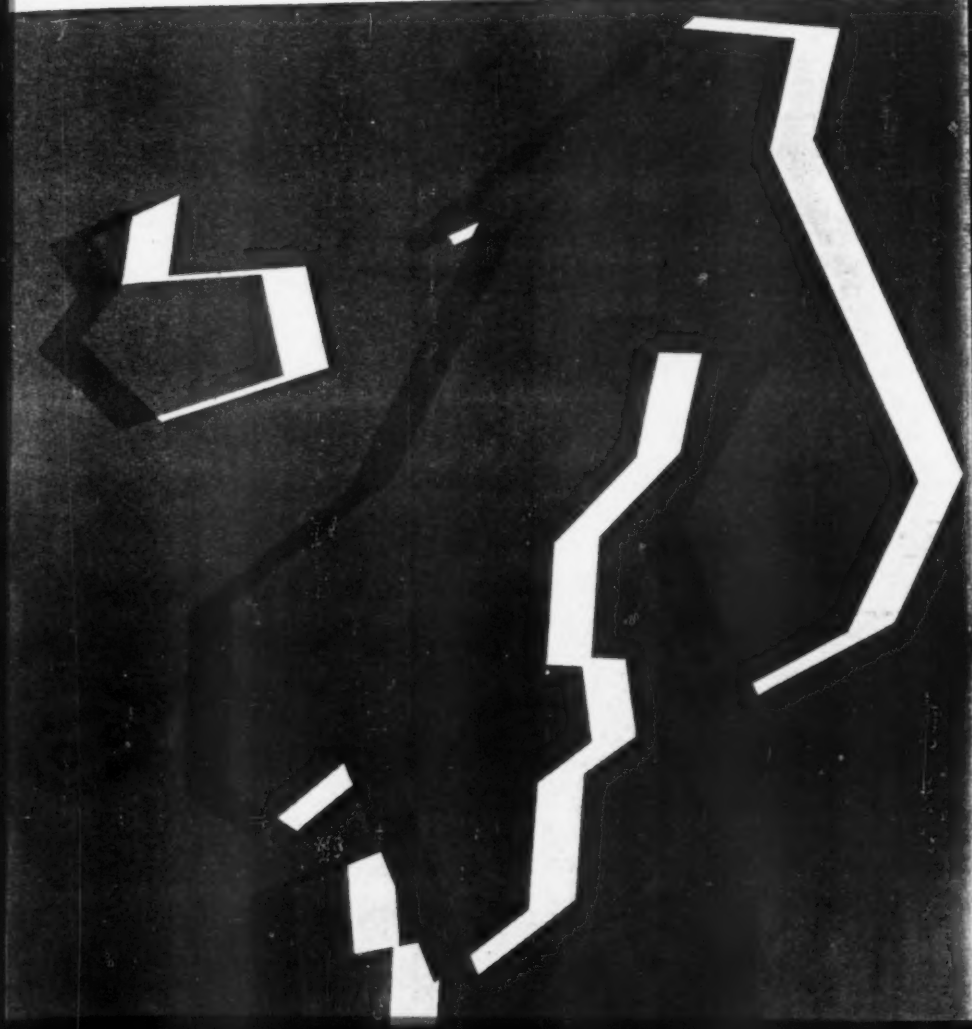

CHEMISTRY INCLUDING METALLURGY SERIES

Ch 142 UDC 678.743:620.187

JOHANSSON, LENNART and TÖRNELL, BERTIL: *SEM studies of fractures of rigid PVC pipes.* Acta Polytechnica Scandinavica, Chemistry including Metallurgy Series No. 142. Helsinki 1980. 15 pp. ISBN 951–666–121–1: ISSN 0001–6853.

The fracture surface obtained in testing according to a standard method for time-to-failure under internal pressure were examined in a scanning electron microscope. The most frequent cause of fracture initiation at low pressures was found to be particles. Microanalyses by an energy-dispersive X-ray spectrometer indicated that the particles mainly consisted of impurities. The fracture surfaces obtained in tests at high stresses and short times were totally covered with threads and it was impossible to localize a point of initiation.

Ch 143 UDC 678.743:620.187

HASSANDER, HELEN and TÖRNELL, BERTIL: *EM studies of the morphology of rigid PVC resins.* Acta Polytechnica Scandinavica, Chemistry including metallurgy Series No. 143. Helsinki 1980. 20 pp. ISBN 951–666–122–X. ISSN 0001–6853.

The changes in resin morphology that occur during processing of rigid PVC can be studied by TEM after embedding in polymermethacrylates. With this technique it has been shown that during processing S-PVC (suspension PVC) disintegrates into primary particles (0,5–2 μm), which are subsequently broken down into very fine particles (about 0,1 μm). Emulsion resins break down to emulsion latex particles, which seem to keep their identity.

The presence of intact S-PVC primary particles in rigid PVC indicates incomplete gelatination. A large number of such primary particles were found to be present in a PVC pressure pipe, which, according to tests with methylene chloride, was not fully gelatinized, and in the fracture area of a pressure pipe, where fracture occured very early in a time-to-failure test under internal pressure.

Ch 144 UDC 539.37.5

KORHONEN, A.S.: *Localization of plastic flow and ductile fracture in metals.* Acta Polytechnica Scandinavica, Chemistry including Metallurgy Series No. 144, Helsinki 1980, 33 pp. ISBN 951–666–128–9. ISSN 0001–6853.

Experimentally observed ductile fracture patterns will be analyzed within the framework of the conventional plasticity theory. It is suggested that although the initiation of the fracture cannot directly be predicted by continuum theory the observed overall fracture patterns in most cases closely correspond to those that could be expected on the basis of the theory.

Ch 145 UDC 669.35'24'787:541.123.3:669.017.11

TASKINEN, PEKKA: *Liquidus equilibria and solution thermodynamics in copper-rich copper-nickel-oxygen alloys.* Acta Polytechnica Scandinavica. Chemistry including Metallurgy Series No. 145, Helsinki 1981, 45 pp. ISBN 951–666–131–9. ISSN 0001–6853.

Liquidus equilibria and solution thermodynamics in ternary copper-nickel-oxygen melts were studied by solid electrolyte oxygen concentration cells at 1065–1450 °C in a concentration range of up to 5.4 at%$[Ni]_{Cu}$ and 6.3 at%$[O]_{Cu}$. The ternary eutectic point was found to locate at 1065.5 ± 0.5 °C with a composition of 0.34 ± 0.04 at%$[Ni]_{Cu}$ and 1.84 ± 0.04 at%$[O]_{Cu}$. The activity coefficient of oxygen at infinite dilution in liquid copper is

$$\ln f_O^o = 4.529 - \frac{8961.5}{T/K} \pm 0.05$$

and the self interaction coefficient of oxygen

$$\epsilon_O^O = 16.18 - \frac{35\,550}{T/K} \pm 0.5\,.$$

A short thermodynamic analysis revealed that the solution thermodynamics obtained are consistent with the observed liquidus surfaces.

Ch 146 UDC 669.4'787:541.122.3

TASKINEN, ANJA: *Oxygen-Metal (Ag, Au, Bi, Cu, In, Ni, Sb, Sn, Te) interactions in dilute molten lead alloys.* Acta Polytechnica Scandinavica, Chemistry including Metallurgy Series No. 146, Helsinki 1981, 44 pp. ISBN 951–666–137–8, ISSN 0001–6853.

Oxygen activities in lead and dilute lead-based alloys were measured at 762 to 1000°C (at 1035 to 1273 K) by a solid electrolyte cell technique. The temperature dependences of the first order interaction coefficient of *Me* on oxygen, ϵ_0^{Me}, in liquid lead were determined as:

Me	ϵ_0^{Me} vs. $1/T$ (T in K)				
Ag	$-14.7 + 20.43 \cdot 10^3/T$	(±0.1)	Ni	$+ 8.6 - 31.41 \cdot 10^3/T$	(±1)
Au	$- 8.0 + 13.57 \cdot 10^3/T$	(±0.1)	Sb	$+15.3 - 22.16 \cdot 10^3/T$	(±0.3)
Bi	$- 9.8 + 11.78 \cdot 10^3/T$	(±0.2)	Sn	$+75.5 - 129.13 \cdot 10^3/T$	(±3)
Cu	$+ 5.9 - 11.60 \cdot 10^3/T$	(±0.2)	Te	$+17.1 - 21.74 \cdot 10^3/T$	(±0.1)
In	$+29.5 - 61.95 \cdot 10^3/T$	(±0.4)			

The measured ϵ_0^{Me} values have been compared with the predicted ones based on different models.

Ch 147 UDC 66.063:66.021.2:532.529

LAINE, JOUKO and PALOSAARI, SEPPO: *Liquid circulation in stirred tanks.* Acta Polytechnica Scandinavica, Chemistry including Metallurgy Series No. 147. Helsinki 1982, 18 pp. ISBN 951–666–143–2. ISSN 0001–6853.

The thank volume is divided into a number of hypothetical or real subvolumes where complete mixing is being assumed. The flow rates between these subvolumes are chosen to meet the requirements of the mixing process. The acceptable maximum length of time is then chosen to achieve a desired quality of mixedness. Then, from these data and from the known system parameter, the rotational speed of impeller is calculated, which gives the desired level of mixing. The determination and nature of the system parameter is discussed. Only Newtonian liquids are being dealt with.

CIVIL ENGINEERING AND BUILDING CONSTRUCTION SERIES

Ci 80 UDC 556.5(1–21):551.577.13:556.164:628.31

MELANEN, MATTI: *Quantity, composition and aerial load of urban runoff water in Finland.* Acta Polytechnica Scandinavica, Civil Engineering and Building Construction Series No. 80. Helsinki 1981. 32 pp. ISBN 951–666–139–4. ISSN 0355–2705.

Experiments were made during a three-year period on the rainfall-runoff relationships, and the composition of runoff water and precipitation (aerial particle deposition) in seven urban test catchments.

During rainfall-runoff events, on the average, the proportion of surfaces generating direct runoff in an urban catchment was found to account for 50–80 per cent of the proportion of paved surfaces in the residential catchments, and for 80–90 per cent in the city centres and industrial catchments.

As for the main parameters, the average composition of storm-runoff water varied as follows: suspended solids 89–280 mg l^{-1}, biochemical oxygen demand (BOD_7) 9–28 mg l^{-1} O_2, chemical oxygen demand (COD_{Cr}) 93–200 mg l^{-1} O_2, total phosphorus 0.25–0.43 mg l^{-1} P, total nitrogen 1.1–2.2 mg l^{-1} N, lead 0.092–0.43 mg l^{-1} Pb and pH 6.7–7.2.

The proportion of the aerial pollutant load in the urban runoff water was found to be of the following order of magnitude: 1/2–3/4 for sulphate, 1/2–2/3 for total nitrogen, 1/4–1/2 for vanadium, 1/4–1/3 for organic matter and copper, 1/4 for total phosphorus, 1/5–1/4 for lead, 1/5 for total solids, 1/10–1/5 for zinc and 1/20–1/5 for chloride.

ELECTRICAL ENGINEERING SERIES

EI 43

UDC 681.616.7
681.327.22

TERVONEN, MIKKO, HAKALAHTI, HANNU and LAPPALAINEN, PENTTI: *A microprogrammable character generator for a CRT phototypesetting system.* Acta Polytechnica Scandinavica, Electrical Engineering Series No. 43, Helsinki 1980. 38 pp. ISBN 951–666–124–6. ISSN 0001–6845.

A new character encoding method applicable to the encoding of the font files of CRT phototypesetters is described. The structure of the corresponding character generator is also presented and its performance is shown. Character encoding is accomplished by approximating the outlines of each character by means of line segments and elliptical arcs. The parameters defining these for each character are stored in a read only memory. Algorithms for computing line segments and elliptical arcs are given. The character generator is implemented using a microprogrammable LSI bit-sliced microprocessor. The new method results in reduced memory requirements and a cost-effective character generator in comparison with earlier digital encoding methods.

EI 44

UDC 681.616.7
681.327.22

HAKALAHTI, HANNU, TERVONEN, MIKKO and LAPPALAINEN, PENTTI: *A photocopy control unit for a CRT phototypesetting system.* Acta Polytechnica Scandinavica, Electrical Engineering Series No. 44. Helsinki 1980. 28 pp. ISBN 951–666–125–4. ISSN 0001–6845.

This paper describes a photocopy control unit for a CRT phototypesetting system. The unit converts digitally encoded character information into a format suitable for a CRT photocopy unit. The system is compatible with the microprogrammed character generator (MCG) developed in the Laboratory of Computer Engineering, University of Oulu, Finland

As an introduction, the general organization of a phototypesetting system is briefly discussed and a method for high-quality image generation on a CRT faceplate is studied. A system for unpacking the character outline data computed by MCG is introduced and a method for generating different versions of a character on the basis of a single font record is developed. The organization of the photocopy control unit is described. Finally, examples of characters produced by the system are given.
The proposed system for image generation in CRT phototypesetters – the use of the MCG and a proper code unpacking and processing system – results in savings in memory space, speeds up font selection and makes the generation of new font types more flexible compared with existing systems.

E1 45

UDC 551.467:621.317.335.3
528.8.04

HALLIKAINEN, MARTTI: *Dielectric properties and passive remote sensing of low-salinity sea ice at UHF frequencies.* Acta Polytechnica Scandinavica, Electrical Engineering Series No. 45. Helsinki 1980. 78 pp. ISBN 951–666–126–2. ISSN 001–6845.

The dielectric properties and passive remote sensing of low-salinity first-year sea ice are studied. The brightness temperature of sea ice is obtained theoretically using a flow graph analysis. Fluctuations in the properties of snow and ice are included using an approximate method. The theoretical calculations are based on the dielectric properties of nearly 400 ice samples measured at two UHF frequencies. The brightness temperature of sea ice was measured by airborne single-channel and multichannel radiometers in different weather conditions. The good agreement between theory and experiment confirms the validity of the theory at UHF frequencies.

E1 46

UDC 621.372.622:621.3.029.65:536.48

RÄISÄNEN, ANTTI V.: *Experimental studies on cooled millimeter wave mixers.* Acta Polytechnica Scandinavica, Electrical Engineering Series No. 46, Helsinki 1980, 55 pp. ISBN 951–666–127–0. ISSN 0001–6845.

The design and performance of two cooled mm-wave mixers is described. A Josephson point contact mixer was designed for 30–40 GHz. The Nb point contact is located in a symmetrical Nb waveguide flange using suitable insulating material. This construction allows the junction to be adjusted at T_{room} and makes it mechanically stable against shocks and temperature cycling. At 36 GHz the conversion loss was measured to be 5 dB when using an IF of 60 MHz. The mixer works evenly at frequencies 30–40 GHz. A cooled Schottky diode mixer was designed for 75–120 GHz. New details of this mixer include improved waveguide, backshort, RF filter and IF matching and bias circuit designs. This mixer is used in a cooled receiver (15 K) where LO is coupled by an adjustable ring-filter. The mixer is followed by a 4.5–5.0 GHz IF system of T_{IF} = 24 K. For this receiver DSB noise temperatures of T_{RDSB} = 140–230 K have been measured at any LO frequency from 75 to 120 GHz. The best SSB receiver noise temperature measured is T_{RSSB} = 275 K at 88 GHz including a quasi-optical feed system. This implies a mixer noise temperature of T_{MSSB} < 100 K. Finally a discussion on noise temperature and noise figure calculations and noise measurements is presented.

E1 47

UDC 534-8 : 778.38
620.179.16

ALASAARELA, ESKO, SAUKKONEN, SAMULI and TAURIAINEN, ANTTI: *An imaging apparatus based on ultrasonic holography.* Acta Polytechnica Scandinavica, Electrical Engineering Series No. 47, Helsinki 1981, 29 pp. ISBN 951–666–133–5. ISSN 0001–6845.

An apparatus that can be used to record and reconstruct ultrasonic holograms of objects immersed in water has been designed and constructed. The main parts of the apparatus are a control unit and a transceiver unit. The operation of the apparatus has been tested by numerous experimental imagings. In these experiments the image was reconstructed optically using laser light. These imagings prove that the apparatus can well be used for studying the imaging properties and potential applications of ultrasonic holography.

EI 48

UDC 621.313.291.3:537.312
546.3–14:532.535

ERIKSSON, JARL-THURE: *Superconducting homopolar machinery: Liquid metal current collection and design principles.* Acta Polytechnica Scandinavica, Electrical Engineering Series No. 48, Helsinki 1981. 184 pp. + app. 4 pp. ISBN 951–666–144–0. ISSN 0001–6845.

The thesis deals with the current collection problem of superconducting homopolar machines. It is stated that, considering the current capacity and collector losses, liquid metal contacts provide the only realistic solution.

Porous electrode surfaces made from spun tungsten wire are suggested prior to chromium plated contacts, although chromium exhibits acceptable corrosion resistancy against gallium-indium, the number one applicant liquid metal.

A cover liquid is proposed to handle the liquid metal purification. Given the proper consistency the cover liquid prevents emulsification and works as a damper fluid against hydrodynamic instability.

A phenomenologic explanation of the ejection instability, typical of open channel Couette flow, has been developed from the Kelvin-Helmholtz concepts. The model is strongly supported by the extensive experimental material. Accordingly a scheme for collector geometry dimensioning could be established.

Finally the design procedure of superconducting homopolar machines is presented in order to offer a practical working tool for a rough estimation of losses, efficiency, an adequate number of armature current loops and the necessary amount of superconducting wire.

MATHEMATICS AND COMPUTER SCIENCE SERIES

Ma 32 UDC 62-50:517.941.92:512.8

YLINEN, RAIMO: *An algebraic theory for analysis and synthesis of time-varying linear differential systems.* Acta Polytechnica Scandinavica, Mathematics and Computer Science Series No. 32. Helsinki 1980. 61 pp. ISBN 951–666–120–3. ISSN 0355–2713.

A polynomial systems theory for time-varying linear differential systems is developed and applied to analysis and synthesis problems. The main structure is a module of signals over a ring of skew polynomials consisting of time-varying differential polynomials. Differential input-output relations are defined as kernels of polynomial matrix operators. All relevant realizability properties of linear differential systems and their interconnections are then embedded into properties of input-output relations and their composition and, furthermore, into algebraic properties of polynomial matrices. Also the other important concepts e.g. properness, stability, controllability and observability related to systems and interconnections are analyzed. Finally, two basic synthesis problems, the feedback controller and the observer synthesis problems, are investigated and solved using the polynomial systems theory.

Ma 33 UDC 681.5.015:579.24:663.15:628.356

HOLMBERG, ANDREA: *A systems engineering approach to biotechnical processes – Experiences of modelling, estimation and control methods.* Acta Polytechnica Scandinavica, Mathematics and Computer Science Series No. 33, Helsinki 1981, 46 pp. ISBN 951–666–136–X. ISSN 0355–2713.

This paper constitutes a survey of systems engineering procedures which have been developed and applied in connection with investigations of some microbial and plant growth processes. The research methods and experiences concern single-cell fodder protein production from sulphite spent liquor by continuous cultivation of *Paecilomyces varioti* (the Pekilo process), exotoxin production by batch fermentation of *Bacillus thuringiensis* and the activated sludge waste water treatment process. Process modelling, parameter and state estimation and control of the processes are described, with an emphasis on practical performance and certain difficulties connected with the biological nature of the processes. In connection with parameter estimation the properties of the Michaelis-Menten equation are analyzed and it is shown that the parameters are not generally identifiable in the presence of noisy measurements. A state estimation algorithm for estimating nonmeasurable variables, such as bacterial growth, biomass, substrate and product concentrations, with the aid of oxygen consumption or heat production rates, is introduced and demonstrated in connection with the processes described above. The estimation algorithm has been implemented to the activated sludge process using a microprocessor.

Ma 34 UDC 681.3.025

TAMMINEN, MARKKU: *The EXCELL method for efficient geometric access to data.* Acta Polytechnica Scandinavica, Mathematics and Computer Science Series No. 34, Helsinki 1981, 57 pp. ISBN 951–666–142–4. ISSN 0355–2713.

The extendible cell (EXCELL) method provides a data structure for efficient geometric access. It stores geometric data in computer storage blocks corresponding to disjoint variable sized rectangular cells accessible by an address calculation type directory.

We describe the method for point files and files of more complicated geometric objects and analyze theoretically its performance. We report algorithms for the nearest neighbour and point-in-polygon-network problems and describe applications to geographical data bases, hidden line elimination and geometric modeling.

This article is a summary of several independent studies on EXCELL. The main results of the whole work reported here are the methods of analyzing geometric cell-oriented data structures and the general results on expected and worst case performance obtained using them.

MECHANICAL ENGINEERING SERIES

Me 78 UDC 536.24

SAASTAMOINEN, JAAKKO: *Heat transfer in unidirectional regenerators.* Acta Polytechnica Scandinavica, Mechanical Engineering Series No. 78. Helsinki 1980. 80 pp. ISBN 951–666–118–1. ISSN 0001–687X.

This study investigates the behaviour of regenerators when the direction of the gas flow remains unchanged and the entrance temperature of the gas changes with time, especially according to the meander function. Heat conduction in the solid elements (plates, spheres, cylinders, square wires or cubes) is taken into account by solving the Fourier heat conduction equation. Simplified methods applicable for arbitrarily shaped material elements are presented; in these methods the inner thermal resistance of the elements is added to the surface resistance. The responses of regenerators to arbitrary solid initial temperature and gas entrance temperature are dealt with, and a series solution for cross-flow recuperators obtained as a byproduct is presented. Some numerical methods are described in which the periodic state of operation is attained by iterative calculations. Using matrix calculus the periodic state can be reached directly, and explicit matrix formulas for the temperatures and the efficiencies are derived; this method also includes the effect of heat conduction in the solid in the direction of the gas flow, and it can also be modified for counterflow operation.

Me 79 UDC 621.51

AIRILA, MAURI: *An analytic study of the throttling control methods of liquid-cooled rotary screw air compressors, with a view to minimizing energy demand.* Acta Polytechnica Scandinavica, Mechanical Engineering Series No. 79. Helsinki 1980. 71 pp. ISBN 951–666–123–8. ISSN 0001–687x.

Linear models are developed for the screw compressor and compressed air system. With the help of the models, differences in energy demand between different throttling control methods are analysed over a given short time interval. On the basis of these differences, criteria are determined for the most expedient control method in various operations and the optimum pressure difference is defined for on/off line control.
The analyses reveal that both modulating and on/off line control have clearly defined areas of expediency, whose extent is essentially a function of certain constructional parameters. An increasing volume of compressed-air system and a decreasing internal tank pressur during idling facilitate more expedient use of on/off line control.
The results are illustrated using sets of diagrams drawn on the basis of the specimen calculations.
The results were used to compile a logic diagram according to which it is possible continuously and unambiguously in all operations during compressor run to find the most expedient throttling method. Application of the diagram requires measurement of air demand and system pressure and that the calculations be performed by computer.

Me 80 UDC 539.42
620.17

OHLSON, NILS-GUNNAR: *Crack initiation criteria in combined modes of loading.* Acta Polytechnica Scandinavica, Mechanical Engineering Series No. 80. Helsinki 1981. 21 p. ISBN 951–666–132–7. ISSN 001–687X.

For an arbitrarily oriented crack, combined modes of loading are usually encountered. Several initiation criteria for this situation have been suggested in literature. The present paper is concerned with an attempt to verify by experiments which criterion seems most reasonable.

Experiments were carried out in mode I + II as well as in mode I + III. Several metals were used, which display various amounts of yielding before the crack starts growing.

It is shown that crack initiation is well predicted by an effective stress-intensity factor for cases where linear elastic fracture mechanics is applicable. The J criterion may be used for non-linear cases. If crack closure occurs, the effect of friction will invalidate these conclusions.

Me 81 UDC 621.7/9

IHALAINEN, ERKKI K.: *Simple diffractometrical procedure to determine the damaged surface layer in grinding of Hadfield manganese steels.* Acta Polytechnica Scandinavica, Mechanical Engineering Series No. 81. Helsinki 1981. 24 pp. ISBN 951–666–141–6. ISSN 0001–687X.

This study investigates the thickness and the structure of the damaged surface layer in Hadfield steel produced by the finishing grinding. The volume of martensite in the structure, generated by plastic flow, is measured with a diffractometer and material is detached electrochemically step by step. The samples were ground with the depth of cut used in finishing grinding while other parameters were kept constant. The thickness of the damaged layer is presented according to the results of martensite volume measurements and the quality of the structures in damaged surface layer is identified with diffraction pattern pictures obtained by electron microscope.

APPLIED PHYSICS SERIES

Ph 127 UDC 532.517.4:532.542

ALFTHAN, C. von and RANTAPUSKA, S.: *Rates of turbulent transfer to a pipe wall in the mass transfer entry region.* Acta Polytechnica Scandinavica, Applied Physics Series No. 127. Helsinki 1980. 16 pp. ISBN 951–666–119–X. ISSN 0355–2721.

Proceeding from the assumption that turbulent mass transfer for high Schmidt numbers can be described by a thin layer at the wall, with molecular diffusion and perfect mixing in other regions, an expression for the mass transfer is derived. This is simultaneously valid for short, intermediate, and long transfer sections. The expression contains series of Bessel functions and the zero points of other Bessel functions. From this expression various approximations have been found which are easy to use in practice. As an example of their use the expressions for the mean transfer for arbitrarily changing wall concentrations are derived.

Ph 128 UDC 534–8:616–073

MATTILA, P., MERILÄINEN, P., LUUKKALA, M. and REVONTA, M.: *Sinuscan, a simple ultrasonic instrument to detect maxillary and frontal sinusitis.* Acta Polytechnica Scandinavica, Applied Physics Series No. 128, Helsinki 1981, 8 pp. ISBN 951–666–129–7. ISSN 0355–2721.

A simple, portable ultrasonic unit, which has been developed to detect maxillary and frontal sinusitis in humans, is described. The unit contains a probe unit which has as integrated LED array, which lights up in a distinct way when the patient has sinusitis.

Ph 129

UDC 550.34.01
550.83

RISKA, D.O.: *On the gravimetric inversion problem.* Acta Polytechnica Scandinavica, Applied Physics Series No. 129, Helsinki 1981, 25 pp. + app. 5 pp. ISBN 951–666–134–3, ISSN 0355–2721.

The multipole expansion series for the gravitational potential and acceleration anomalies on the flat surface of the earth due to a subterranean body of finite extent are inverted. Explicit formulae for the multipole moments are given in terms of the potential and acceleration components on the surface. Finally a model independent method for the determination of the shape of a starlike body of fixed density from the multipole moments is presented. The results lead to a constructive approach to the inversion problem of gravimetry and also indicate an optimal set of measurement points.

Ph 130

UDC 678.073 : 620.178.73

PÄÄKKÖNEN, E.J., KUOKKALA, V-T. and TÖRMÄLÄ, P.: *Studies of the dynamic and mechanical properties of thermoplastics by the split Hopkinson pressure bar method.* Acta Polytechnica Scandinavica, Applied Physics Series No. 130, Helsinki 1981, 26 pp. ISBN 951–666–135–1. ISSN 0355–2721.

The split Hopkinson pressure bar method in the investigation of thermoplastics is introduced in depth.

Compression tests at strain rates of the order of $10^3\ s^{-1}$ were performed on polypropylene, polyamide 6 and polycarbonate. The materials were studied in both elastic and plastic deformations over a temperature range of −110° (133 K) to +160°C (433 K). The stress-strain curves were determined from the computed measurement data. The yield strength for all materials was approximately 300 N/mm^2 and the elastic modulus was about 20000 N/mm^2 at room temperature. Curves of three types were obtained in the plastic experiments and the differences were explained by means of relaxation theory.

The damping factor was determined for all materials from the measurement result. The loss modulus of polycarbonate was calculated from the temperature rise in the specimens.

In addition the influence of annealing on the properties of polycarbonate was studied using split Hopkinson pressure bar tests.

Ph 131

UDC 550.83

RAJALA, J. and RISKA, D.O.: *On the inversion problem of magnetic ore prospecting.* Acta Polytechnica Scandinavica, Applied Physics Series No. 131. Helsinki 1981. 12 pp. ISBN 951–666–138–6. ISSN 0355–2721.

The multipole expansion series for the magnetic anomaly due to a subterranean magnetized ore in a nonmagnetic environment is inverted. Explicit formulae for the multipole moments are given in terms of the vertical and horizonthal components of the magnetic field anomaly on the surface. A model independent method for determination of the shape of the ore is described for the case of a finite starlike ore with uniform magnetization. The results constitute a systematic method for interpretation of magnetic anomaly data that is far more convenient than model dependent fitting of raw data.

Ph 132 UDC 539.26:548.73

TUOMI, T., KELHÄ, V., NAUKKARINEN, K. and BLOMBERG, M.: *Synchrotron X-ray topography: A Multistereoscopic Imaging technique.* Acta Polytechnica Scandinavica, Applied Physics Series No. 132. Helsinki 1981. 12 pp. ISBN 951–666–140–8. ISSN 0355–2721.

A large number of high resolution stereo pairs of x-ray diffraction topographs are obtained in an exposure time of even less than one second using a polychromatic parallel beam of synchrotron radiation from an electron-positron storage ring. Any two topographs of a Laue transmission or back-reflection pattern form a stereo pair. Stereo pairs of topographs taken from an Fe-3wt%Si polycrystal and from a laser annealed ion-implanted Si single crystal are shown and a method to measure the depth of a defect is presented.

AUTHOR INDEX

	Page
Alasaarela, E.	6
Alfthan, C. von	12
Airila, M.	10
Blomberg, M.	14
Eriksson, J.-T.	7
Hakalahti, H.	5
Hallikainen, M.	6
Hassander, H.	1
Holmberg, A.	8
Ihalainen, E.K.	11
Johansson, L.	1
Kelhä, V.	14
Korhonen, A.S.	2
Kuokkala, V.-T.	13
Laine, J.	3
Lappalainen, P.	5
Luukkala, M.	12
Mattila, P.	12
Melanen, M.	4
Meriläinen, P.	12
Naukkarinen, K.	14
Ohlson, N.-G.	11
Palosaari, S.	3
Pääkkönen, E.J.	13
Rajala, J.	13
Rantapuska, S.	12
Revonta, M.	12
Riska, D.O.	13
Räisänen, A.V.	6
Saastamoinen, J.	10
Saukkonen, S.	6
Tamminen, M.	9
Taskinen, A.	2
Taskinen, P.	2
Tauriainen, A.	6
Tervonen, M.	5
Tuomi, T.	14
Törmälä, P.	13
Törnell, B.	1
Ylinen, R.	8

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